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Online Invoice Management System

Software as a Service

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This project aims at developing a robust online invoicing application based on the Software as a Service model. The system, called ProInvoicer, is designed to contain five important modules: Customer Relationship, Inventory Management, Order Management, Invoice Management and Report modules. With Small and Medium-sized Enterprises in mind, it serves as a cost-efficient alternative to expensive software solutions provided by installing business applications for companies on their premises.

In addition to generating and sending invoices in an easy and automated fashion, the system will enable its users to manage their customer information, stock details, orders and sales more effectively. However, since invoices are one of the most important documents exchanged between business partners, they should be presented in conformity with modern day technology and through digitized channels, which include web and SMS. This results in positive business outcomes and taxation transparency.

Though Software as a Service is one of the cloud computing service models, this thesis does not discuss cloud computing in detail. Instead, the emphasis is on the features and functionality of the application being developed in this project. The project was carried out in a startup IT company, Web2Fix Oy, based in Helsinki Finland.

Keywords	Invoice, SaaS, Invoicing system, E-invoicing, Online invoicing, PHP, MySQL

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Contents

List of Abbreviations

ERP	Enterprise Resource Planning.
IMS	Inventory Management System.
CRM	Customer Relationship Management.
SaaS	Software as a Service.
SMEs	Small and Medium-sized Enterprises.
LAN	Local Area Network.
ASP	Application Service Provider.
EDI	Electronic Data Interchange.
XML	Extensible Markup Language.
AJAX	Asynchronous JavaScript and XML.
API	Application Programming Interface.
IDE	Integrated Development Environment.
SSH	Secure Shell.
ODBC	Open Database Connectivity.
PDO	PHP Database Object.
PHP	Hypertext Pre-processor.
JSON	JavaScript Object Notation.
HTML	Hypertext Markup Language.

CSS	Cascading Style Sheet.

1 Introduction

The internet, without doubt, has played an important role in digitalizing business processes across companies and organizations of all sizes. It has introduced multiple new channels through which businesses can interact with their customers. A report by Gartner, an Information Technology (IT) research institution, reveals that 70% of all customer interactions will move towards digital, more interactive settings and would be experienced on demand through mediums such as web, mobile and social media platforms by 2017. The generation of today understands technology more than ever and require services delivered as quickly as possible, whenever and wherever they desire.

Nowadays, invoices, which are one of the most important documents exchanged between business partners, should be produced with the intention of disseminating them to a broader range of devices through multiple channels which include web and SMS. Handling invoices, product inventory, customer relations and other business transactions via the internet have been found to be a cost-effective way of accomplishing such tasks. Industry experts predict that communication via internet invoices will enable issuers influence customer behavior in a positive way.

To achieve all these, companies do not have to make huge capital investments by purchasing and maintaining software licenses for applications like Enterprise Resource Planning (ERP), Inventory Management System (IMS) and Customer Relationship Management (CRM) systems and installing them on individual hardware on the business premises. They can instead contain costs, deploy solutions quicker and minimize risk by signing up to use the same application but hosted by a third party and delivered over the internet. This concept is called Software as a Service (SaaS). It is a software licensing and distribution model where applications are hosted by a service provider and delivered to multiple clients over the internet. This is the model that has been adopted in creating ProInvoicer, the application whose development has been described in this thesis.

ProInvoicer is a feature-rich business application in which Customer Relationship, Inventory Management, Order Management and Invoice Management Systems have been integrated and served to customers over the internet. Its purpose is to bring an inexpensive and easy solution to the business operation needs of customers especially the Small and Medium-sized Enterprises (SMEs). The system allows users to create and send

invoices in their own language while their customers receive the invoices in customer-preferred language. It is owned, developed and maintained by Web2Fix Oy, a small IT company based in Helsinki, Finland.

2 Software as a Service

2.1 History

In the 1960s, computers were relatively large but limited in capacity compared to what they are today. IBM's computers at the time, had more processing power but were quite a lot more expensive and costly to maintain. Rather than spending fortunes in acquiring these machines, organizations such as banks, educational institutions and government establishments leveraged the services of IBM by utilizing their mainframe's capabilities to host data from another physical location while the organizations themselves connected their keyboards and monitors with no CPUs, via hubs to multiple terminals. This model was called "time sharing system" and because of its nature, it was considered the first introduction to the SaaS concept. The popularity of this system continued throughout the 1970s and 1980s. It was during this time that the first ever CRM came to life. The system was run via allocated modem and phone line for data transmission to and from clients. [1; 2.]

As the prices and sizes of computers began to fall during the 1990s, businesses thought it necessary for their staff to have personal computers within their work environment which were equipped with on premise applications. This eliminated the need for reliance on time-sharing system. However, this did not bring about the total eradication of SaaS. It instead transformed through Local Area Networks (LANs). This time, applications were installed and hosted on machines in-house, while business data was stored on a central server. Therefore, connections were made through LAN to access data and applications. This arrangement can be viewed as cloud computing in its early form. [2.] This methodology, however, also had its constraints as the sizes of software grew in volume and complexity more than computer hardware could handle. These issues became even more difficult to solve with the high cost of hard drives despite their small capacity. In the years following, the availability of fast broadband connections paved way for the introduction of the idea of storing and hosting data off-site and accessing it via internet. Initially, this concept was called Application Service Provider (ASP) instead of SaaS. The

practice was a failure due to ASP companies' inability to deliver on their promise. These companies hosted and offered multiple client-server applications provided by third-party, while SaaS companies develop their own applications and deliver them using a multi-tenant model which has proven to be a reliable and technically feasible means of data management and software delivery till date. [3.] Figure 1 concisely illustrates the evolution of SaaS since the first conception of the idea to its maturity and wider adoption.

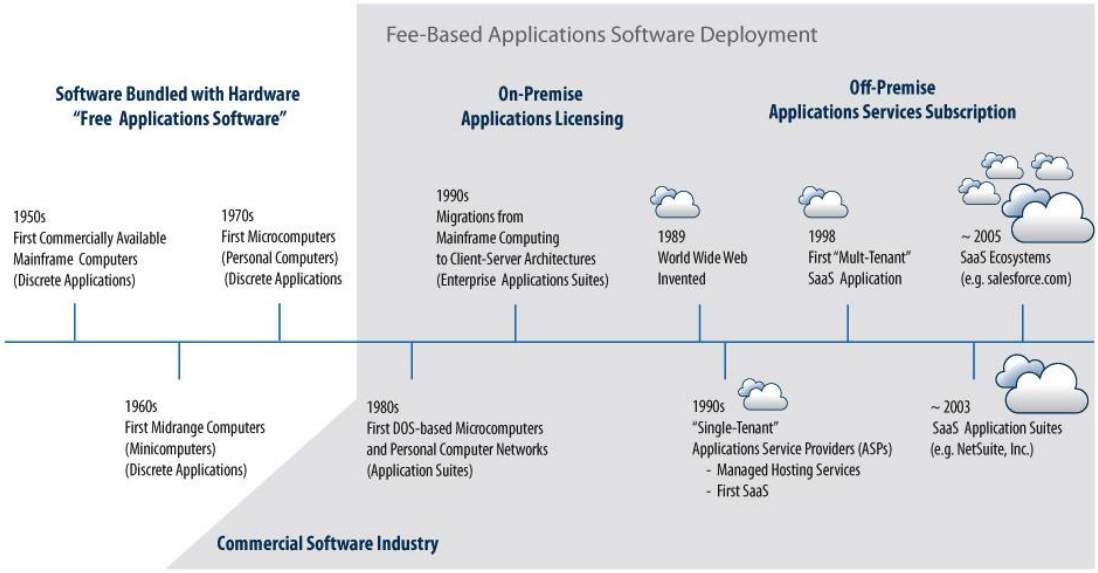


Figure 1. SaaS timeline. Reprinted from Brandall (2017) [1].

As illustrated in Figure 1, the steady growth of SaaS is a pointer to the future of software services. This trend has continued till date, with most SaaS providers such as salesforce, offering subscription-based, off-premise, enterprise grade applications using the multi-tenant architecture.

2.2 The Software as a Service Concept

SaaS is a software licensing and distribution model where applications are hosted by a service provider and delivered to multiple clients over the internet. These applications are accessed via internet browsers by users who are charged subscription fees on re-curring bases monthly or annually. The cost directly reflects the level of usage. Salesforce.com, a CRM tool, is a typical example of this model in use. A typical SaaS deployment model removes the responsibility of installing and maintaining additional hardware or software from the customer and puts it on the vendor. This implies that the

vendor owns the entire cost of infrastructure, training, support, upgrades, storage, database, and security responsibilities. [4.] Figure 2 clearly illustrates the architecture of a typical SaaS model.

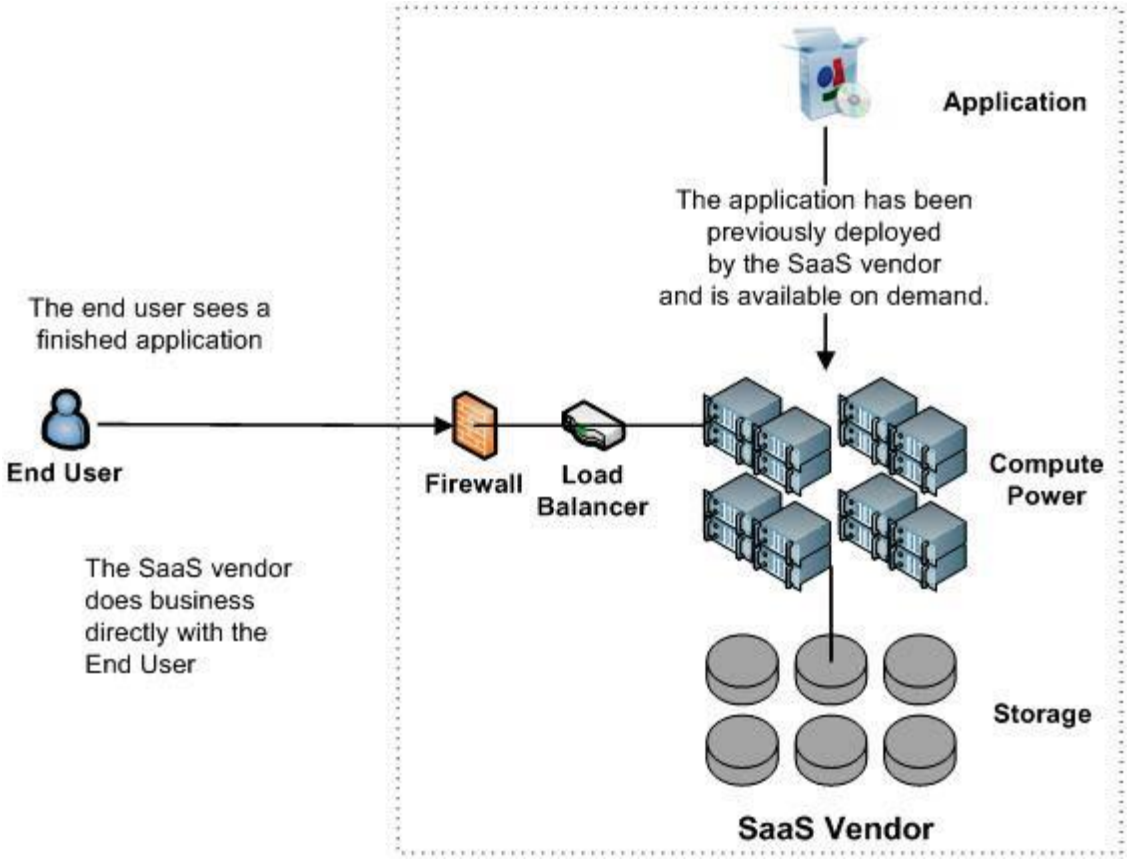


Figure 2. SaaS architecture. Reprinted from Cloud Computing and Software as a Service: An Overview for Security Professionals [5].

As shown in figure 2, all the infrastructure within the area covered by a dotted rectangle is owned and maintained by the SaaS provider. The end user or group of users are only given remote access to a finished and fully operational application with no extra responsibility. What differentiates the SaaS model architecture from that of a traditional software model is the number of tenants or customers the application can support.

2.3 Single-Tenant

This model is depicted in traditional software models where a customer purchases and installs a single instance of a software on a server which runs the application just for that particular customer user group. This architecture allows no room for sharing.

2.4 Multi-Tenant

The idea of this model is that multiple customers share a single instance of a software application and the accompanying back-end hardware infrastructure, while customer data in the database are uniquely and logically separated for each customer. SaaS models are usually multi-tenant in architecture. [4.]

2.5 Benefits of Software as a Service

There is a countless number of advantages associated with the use of SaaS solutions for business applications. These advantages have been described below.

- Cost

  Gartner reported that over 75% of total IT budget goes into the maintenance and running of existing software and systems infrastructure. They also estimated that the cost of ownership and management of software applications in one year can be four times that of the software license itself. In addition, the Wall Street Journal was told by Microsoft in 2002 that the initial cost of a program only amounts to 5% of its total cost of ownership and maintenance. After its analysis of the web conferencing industry, IDC, a global research enterprise, postulated that 70% of the total cost of running conferencing software on premise is spent on hidden personnel costs. The IT expenditure for a typical organization is shared between software, hardware and people services. However, based on the above reports, it can be discovered that hardware and professional services consume the most portion of IT budgets. [4.]

  With the SaaS model, the customer is offered an immense saving potential since the SaaS provider assumes the responsibility of purchasing and maintaining all the server hardware, hosting and supporting relevant applications with the attendant personnel teams; all at the vendor location, in exchange for subscription fees. In this way, the customers do not have to buy software licenses. They only pay for what they use and the subscription can be cancelled anytime without any substantial loss of initial investment. [4.]

- Mobile ready

  SaaS solutions, unlike traditional applications, are technically more adapted to today's world which has a high mobile usage trend. Majority of the available SaaS applications are currently built to also support compatibility with mobile interfaces and clients. This consequently impacts less on the desktop computers and helps extend their lifecycle, thereby creating more savings for the customer. [6;4.]

- Easy Deployment (Saves Time)

  Implementation procedures required for using SaaS applications consume only a fraction of the time and cost required for traditional applications. In view of the fact that the software is already operative on the SaaS provider's servers, the user only requires Internet connection, browser and user account setup to start using the application. Contrary to this, traditional software implementation involves lengthy installation and configuration processes with all the issues that may arise while carrying out these tasks. [7.]

- Fast and Easy Upgrade

  In traditional applications, gaining access to technology enhancements and upgrades, most times require customers to wait until the next upgrade is released. In some cases, an organizational infrastructure improvement would be required or a change in operating system. The implementation of a new release sometimes becomes infeasible given the size of additional capital expense involved. This is however, significantly less cost-efficient and much easier with a SaaS solution. Ongoing product improvements are instantly available to all customer organizations immediately they are released. And since the SaaS vendor is responsible for all updates and upgrades, customers are relieved from the burden of downloading or installing any patches. This also implies that at any given time, customers are served with the latest version of the application. [7;8.]

- Scalability and Flexibility

  There is always the assurance that the application can be scaled up in tandem with growing customer demand. Therefore, consumers do not have to worry

about acquiring additional computing infrastructure. Notably, this is one of the advantages offered by the multi-tenant architecture. [4.]

- Accountability of the SaaS Vendor

  Since SaaS customers only pay an ongoing subscription based fee for the duration of their contract term, providers are obligated to be more accountable than traditional software vendors. And because the SaaS providers' performance is a critical factor to their remaining in business, they undoubtedly would be committed to giving excellent service to their customers. On the other hand, traditional software vendors receive large upfront payments as license fees; and their responsibility is considerably reduced after software deployment. [4.]

- Easy Access

  Since SaaS applications are available on the web, customers only require a computer or mobile device that is equipped with internet access and a web browser to access their application anytime, anywhere. Since most of the current customer population are always engaged in online activity, they therefore expect organizations to communicate with them via their medium of choice. This also provides traveling employees remote access to real-time work data which enhances productivity and convenience. Also, the learning curve for SaaS applications is relatively short, with almost the entire modern day population having internet use experience. [8.]

3 Invoice Management

An invoice is a commercial document which contains billing information that derives from sales transactions between a supplier and a buyer. In other words, it represents a written verification of the delivery of goods and services from a seller to a buyer. Invoices are an important part of the bookkeeping and accounting processes of any business because they hold sales and transaction records. [9.]

According to Enterprise Finland, the minimum data to be contained in an invoice is stipulated by the Value-Added Tax Act, which includes:

- Date of issue of the invoice.
- Identifier for individualising the invoice.
- The seller's VAT ID (Business ID).
- The purchaser's VAT ID in cases of reverse charge in value added taxation and in intra-Community trade.
- The seller's and purchaser's name and address.
- The quantity and nature of the goods, and/or the extent and nature of the services.
- The delivery date for the goods and/or date of providing services or the date of advance payment.
- Tax basis, tax-free price by tax rate, unit price excluding tax and refunds and discounts, if not taken into account in the unit price.
- The tax rate.
- The amount of tax to be paid.
- Reason for tax exemption or for reverse charge in value added taxation.

In special cases, it is required that the invoice should also carry other information. [10.] However, it is important to acknowledge the fact that the invoice is not a solitary document. As portrayed in figure 3, it is associated with several other supply chain business processes, which include contracting, order, delivery, payment and taxation.

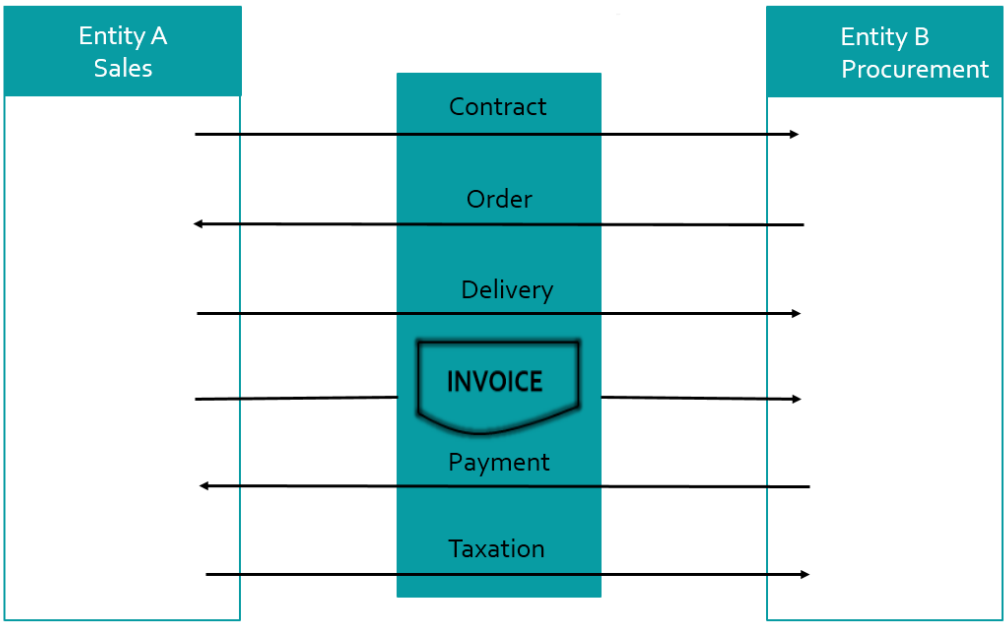


Figure 3. Invoice in a business process. Reprinted from Ali (2016) [11].

Invoices constitute some of the most valuable documents exchanged between business partners, including government institutions. Companies exchange enormous number of invoices daily, both in electronic and paper formats. The real obstacle lies on how efficiently and quickly the invoicing process is handled from order initiation to delivery and payment for goods or services. An invoice management system helps to simplify and organise this process and thereby enhance process transparency. [12.]

The invoice management system generates, sorts and classifies invoices automatically. It also monitors invoice status and sends notifications where necessary. Invoices are automatically archived for the long term. With invoice management structures in place, the quality of invoice data is improved.

Although invoices can be issued in a traditional printed format, e-invoicing provides methods of invoice transmission and processing via electronic means. The major difference between e-invoices and traditional paper invoices is the automated process involved in e-invoices. [9.]

3.1 Paper Invoicing

In spite of today's extensive advancement in digital technology, 90% of the estimated 30 billion invoices exchanged annually in Europe are in paper format. Manual processing of paper invoices has been seen to be among the greatest issues faced by the accounting departments in various businesses. It is time consuming, expensive, labour intensive and susceptible to error, and it has negative environmental effects. With manual handling, invoice reconciliation processes are bound to be slow, and this may give rise to delayed payments and may further affect business relationships.

Since manually processed invoices are printed and sent by mail, there exists the possibility or risk of invoices getting lost in transit. According to Quocirca, the average cost of raising a single unit of paper invoice is €8, while the receiving cost is €10. On the other hand, generating electronic invoices cost only €2. [13.] Figure 4 illustrates a typical manual invoicing process.

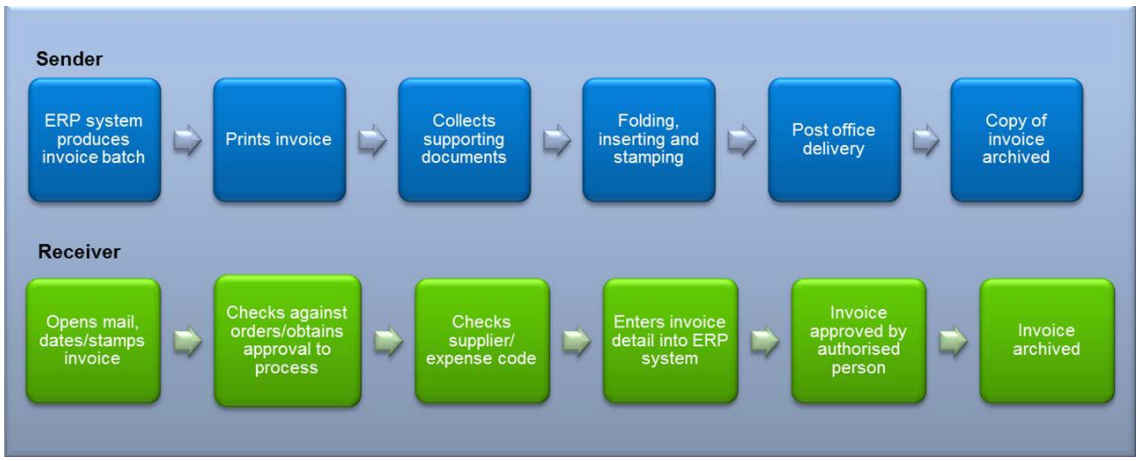


Figure 4. Manual invoicing process. Reprinted from Fernandes et al (2011) [13].

Companies where invoices are manually processed have unsafe exposure to avoidable financial burdens in various areas including storage and archiving of paper invoices; losses may also be incurred in resolution of invoicing disputes. Reliance on paper invoices is a source of additional challenges for bookkeeping and auditing functions. Even meeting European VAT audit requirements may become quite difficult. [13.]

3.2 Electronic Invoicing (E-invoicing)

E-invoicing is not a completely new concept. It has been in existence since the 1960s, but was only used by large aviation and car manufacturing companies. It was adopted by these companies for the purpose of speeding up business information processing tasks to enhance their competitive advantage. The form of e-invoicing solutions available in those days were called EDI (Electronic Data Interchange). These solutions required a very compact relationship between trading partners and were more suitable for large enterprises. Though EDI implementation is very cost-intensive, it has remarkably remained one of the predominant invoicing channels among big organizations till date; however, it is rarely used by smaller companies. The modern method being adopted today for the transfer of standardised text files is XML (Extensible Markup Language). This standard has not been widely accepted since XML is a relatively new technology. The more generally prevalent medium for electronic invoice transfer is as a PDF attachment to an email. [13.]

The legal framework in most countries (Europe, North America, Pacific etc.) describes e-invoices as invoices exchanged in any electronic format which is devoid of paper [14]. Electronic invoicing has been confirmed to be one of the most crucial sources of improved productivity across Europe [15].

3.3 Online Invoicing

A recent Gartner research disclosed that service providers are eager to eliminate paper invoices by sending invoices to their customers via email. On the other hand, customers are very much willing to move online. Findings from a Coleman Parkes consumer research revealed that consumers are ready to embrace self-service. Almost all respondents claimed that they would be happy to recommend their service provider should their self-service channel be more user-friendly. [16.]

Online Invoicing is a web based service that provides businesses with a simplified and strategic way of generating and receiving invoices, tracking payments, monitoring sales and more. It enables customers to view, save and pay bills using their web browser or personal financial management software. An invoice can be directly presented from an

issuer's web site, or sent through a consolidator company's service or portal. Online invoicing solutions offer an inexpensive way of delivering invoice information to customers. They also provide robust and advanced platforms that aid in keeping track of customer information and transaction history, thereby enhancing customer care endeavours. This way, companies can better channel their marketing programs, improve sales in a cost-efficient way and widen their competitive edge. [17.]

3.4 Benefits of Online Invoicing

The following are some of the advantages of using online invoicing.

- Consumers:

1. Convenience

   Various investigations have revealed that the processing time for a single paper invoice costs consumers about five to ten minutes on the average. These processes demand that the invoice be retrieved, sorted, opened, analysed, paid, reconciled, mailed, and filed. In a month, this time could grow into two long hours depending on the amount of invoice received. This lengthy and time consuming process can be significantly shortened using online invoicing means. [17.]

2. Ease

   Electronic invoicing adds speed and much needed efficiency to the bill payment process by making invoices easy to access and manage. It makes the process less cumbersome with a few mouse clicks. [17.]

- Invoice Issuers:

1. Low Cost

Reduced cost is one of the most significant reasons why companies adopt electronic invoicing. It whittles down, if not totally eliminate paper and postage costs. Payment delays due to invoice handling are also eliminated. [17.]

2. Increased Functionality and Time Savings

   By providing their customers with time saving functionalities and services through technology, invoice issuers utilize every available opportunity to distinguish themselves from their competitors. Digitalizing business processes such as the invoice-receiving and payment process would have a positive effect on a company's image, and endear them to their customers. It also increases their efficiency and enables them invest the saved time on their core business. [17;15.]

3. User accounts held by invoice issuers can be a source of useful customer information such as consumer preferences and buying patterns. This can enable companies refine their marketing activity and provide the right marketing content for their customers, and increase revenue. [17.]

4 Application Overview

4.1 The ProInvoicer System

The ProInvoicer system is a robust, cloud based and feature-rich invoicing system distributed under the Software as a Service model. Clients are given subscription based access to the application, which requires payment of monthly or yearly subscription fees. The fee rate depends on the package they subscribe to. Each package contains a range of functionalities unlocked for a specific user group. Depending on the package, clients are availed the opportunity to enter and maintain their customer information, enlist unlimited number of products to their inventory, track their products and their availability on each of their warehouses or store locations and even which shelves the products are stored. They are also given unrestricted access to send unlimited invoices to any number of customers. The system is equipped with multilingual capability. This allows users to create and send invoices in their own language while their customers receive the invoices in customer-preferred language. The system has also been designed to be responsive and accessible through any device or screen size.

ProInvoicer incorporates five tightly integrated components: CRM module, Inventory Management Module, Order Management Module, Invoice Management Module, and Reports module. This means that there is quick and easy access to these services from a single console. Its broad array of functionality is further enriched by integrations with other third party services such as banking, email and SMS services. Currently, ProInvoicer is mainly targeted towards SMEs, most of whom do not have the large upfront capital resources required to invest in full ERP systems. Most SMEs still struggle with manual, paper-driven and labour-intensive processes. This system provides affordable and automated invoice processing solution to their businesses, while facilitating other business areas.

Though generated invoices can be printed and sent by post, the main target channel is through email and SMS. With the ProInvoicer system, no software installation is required on the part of the customer, neither is investment in new hardware infrastructure necessary. Signing up to the service is done at http://www.prolasku.com/, which is at the final

stages of its development. After that, the users are redirected to the back-end administration panel where they can start using the system. As shown in figure 5, the ProInvoicer user interface is designed to be simple and easy to use.

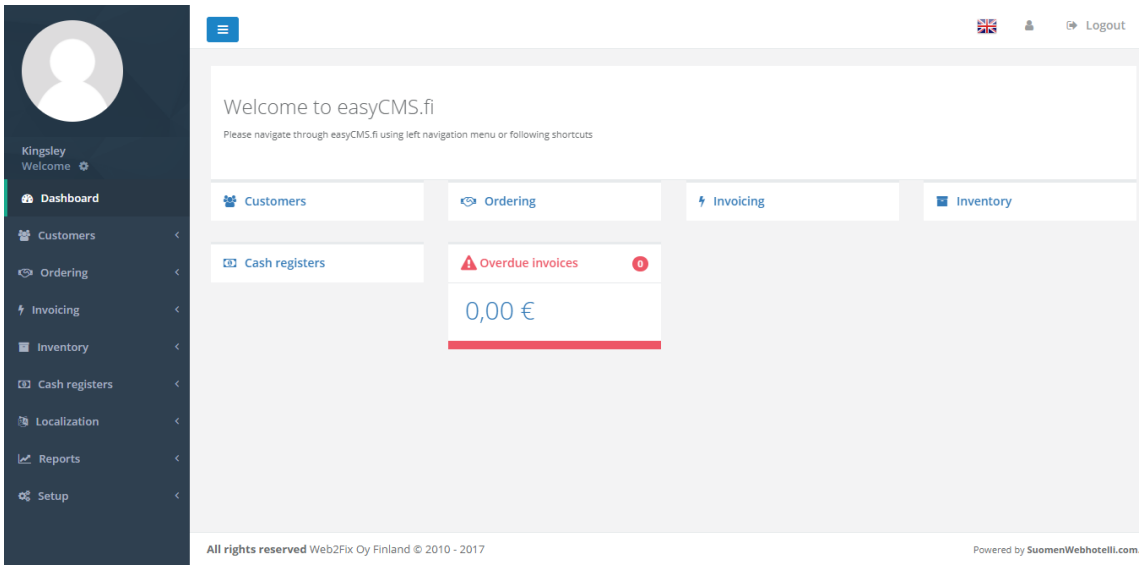


Figure 5. The ProInvoicer Homepage.

The simplicity of the system's homepage, as displayed in figure 5, makes it easy to navigate all the modules contained in the application with a single click. From the dashboard, a user can quickly access the customers, orders, invoicing, inventory or the reports modules.

4.2 Customer Relationship Module

The customer relationship module is tightly bound to the other modules, especially the order management and invoicing modules. This module is of immense importance within the system because it holds all customer details with which interactions are made with customers; and these details are properly organised in logical order within the database. A user or administrator can add, view, modify and delete customers at any time.

Opening the customer module from the dashboard reveals a list of already existing customers that has been previously added. On top of these is an "add new customer" button. When it is clicked, a form is displayed where the new customer details can be entered and saved. There is also an option to send newsletters to the customer which can be

triggered by a checkbox. The idea is to give user companies and businesses the avenue to influence customer behaviour and channel their marketing content to the right audience. The status checkbox is used for setting a customer profile active or inactive. An inactive customer's detail will remain stored in the database but a search for it within the system will return an empty result. A user can also choose the language with which to interact with the customer. By so doing, the invoices and notifications sent to the customers are automatically converted to the customer's language before they are sent. This eliminates any language barrier in communication. Figure 6 displays an "add new customer" form.

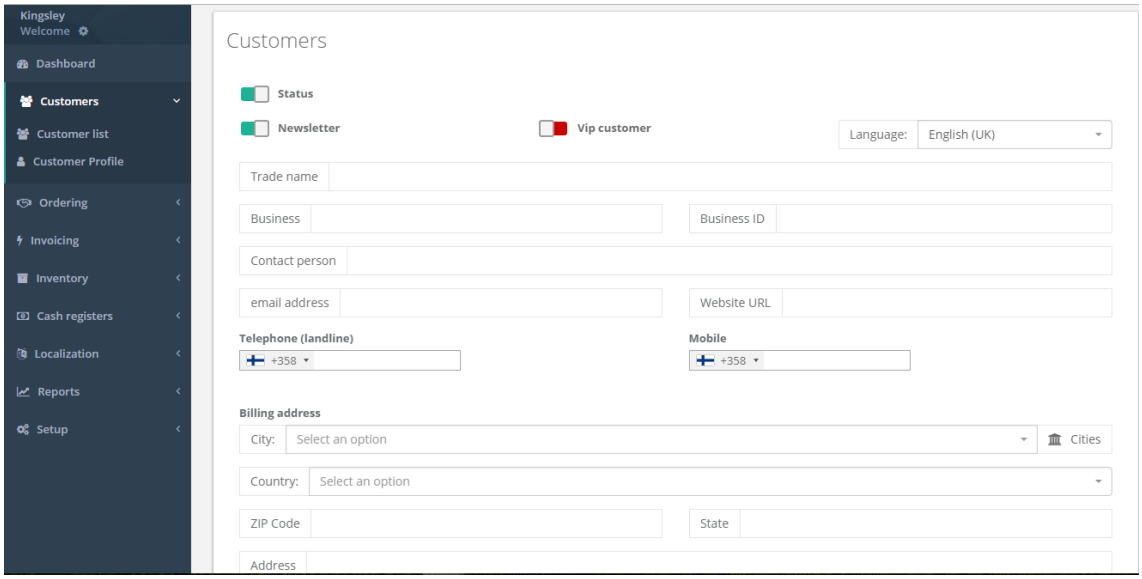


Figure 6. Form to add new customer.

As shown in figure 6, the business information of the customer is to be entered in the customer form, since they also appear in invoices sent to the customer as required by law. The billing address details are required, whereas the shipping address details is optional. They are only required if different from the billing address. Other optional contents in the form are the credit limit offered to the customer, discount in percentage, and payment period for issued invoices. When the form is completed and submitted, its fields are verified and validated by a custom PHP function. On success, the form data is inserted into the appropriate database tables. Displayed in figure 7 is a customer profile page.

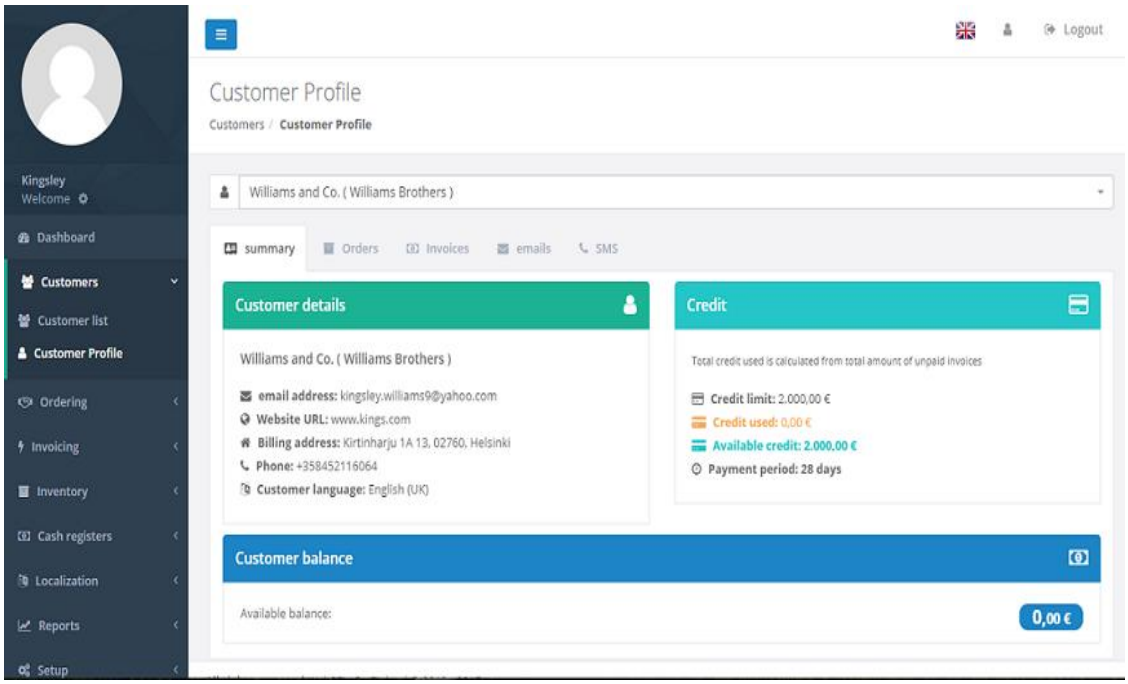


Figure 7. Customer profile.

As shown in figure 7, each customer profile contains five menu items: Summary, Orders, Invoices, emails and SMS. The Summary item holds three panels which includes Customer details, Credit and Customer balance. The Customer details panel contains the customer's email address, website URL, billing address, phone number and the customer's preferred language. The Credit panel holds the credit limit the supplier has assigned to its customer. This means that when the total amount of invoice bills exceeds this limit, the system immediately notifies the supplier. The Customer balance panel shows the customer's available balance. This balance is the total sum of all the customer's overpaid invoices.

The Orders menu item contains all Orders from that specific customer and they are displayed within cards which can be sorted in several ways. These include:

- Total orders – all orders from the customer
- Total draft orders – all orders still in draft mode, that is, those that have not been delivered
- Total uninvoiced orders – all orders which their invoices have not been sent
- Total invoiced orders – all orders which their invoices have been sent
- Total cancelled orders – all cancelled orders

Clicking any of these cards will display all the orders in that category in a tabular list under the following headers: Order number, Invoice number, Customer, Order total, Order date, Shipping method, Delivery date, Reference, and Status. By employing AJAX (Asynchronous JavaScript and XML) technology, the orders are listed according to the header item selected by the user. These orders can be copied, printed or downloaded in excel or PDF format. The Invoices menu item is quite similar to the Orders menu item. All Invoices from a customer are displayed within cards and like the Orders, they are sorted in the following ways:

- Total invoices
- Draft invoices
- Unpaid invoices
- Paid invoices
- Partially paid invoices
- Overdue invoices
- Collections invoices
- Cancelled invoices
- Refunded invoices

The email and SMS menu items contain the emails and SMS's sent out to the customer respectively.

4.3 Order Management Module

All customer purchase requests are first entered into the system as orders and this is done in the Order Management Module. Orders are linked to the customer who has initiated them in the Customer Management Module. They are also linked to the products the customer intends to purchase in the Inventory Management Module and orders can easily be converted to invoices with a single click. Figure 8 shows a form for creating new order.

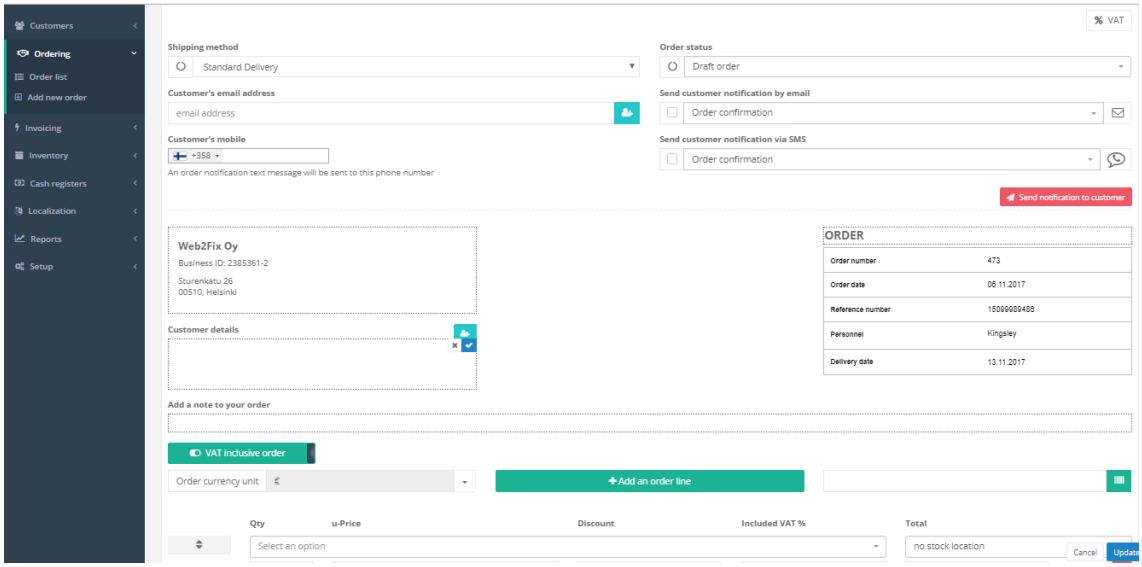


Figure 8. Create new order form.

As shown in figure 8, the Order Management Module has two main submenus: The “Order list” and the “Add new order” menu. When the “create new order” button is clicked, a draft order is automatically created and a form is displayed which contains both prefilled and empty fields for the order. The prefilled fields show the supplier company’s name, business ID and address. Under this is a section for listing existing customers and subsequently selecting the customer which the order belongs to. Another set of prefilled fields shows the order number, order date, reference number, contact personnel and delivery date. Above these are drop down menus where the supplier selects the shipping method for delivering the item, the order status, the type of notifications to send to customer’s email and phone: whether order confirmation, cancellation, modification, update or pickup. The default order currency is the Euro, but there are multiple currency options to choose from. The user can decide whether or not to include VAT to the product prices by toggling the “VAT inclusive order” button. By clicking “Add an order line” button, multiple items can be ordered at the same time. In summary, each item’s quantity, discount, unit price and total price are listed under the item and the order can be printed, downloaded or viewed in PDF format. Figure 9 shows a screen shot of an order list.

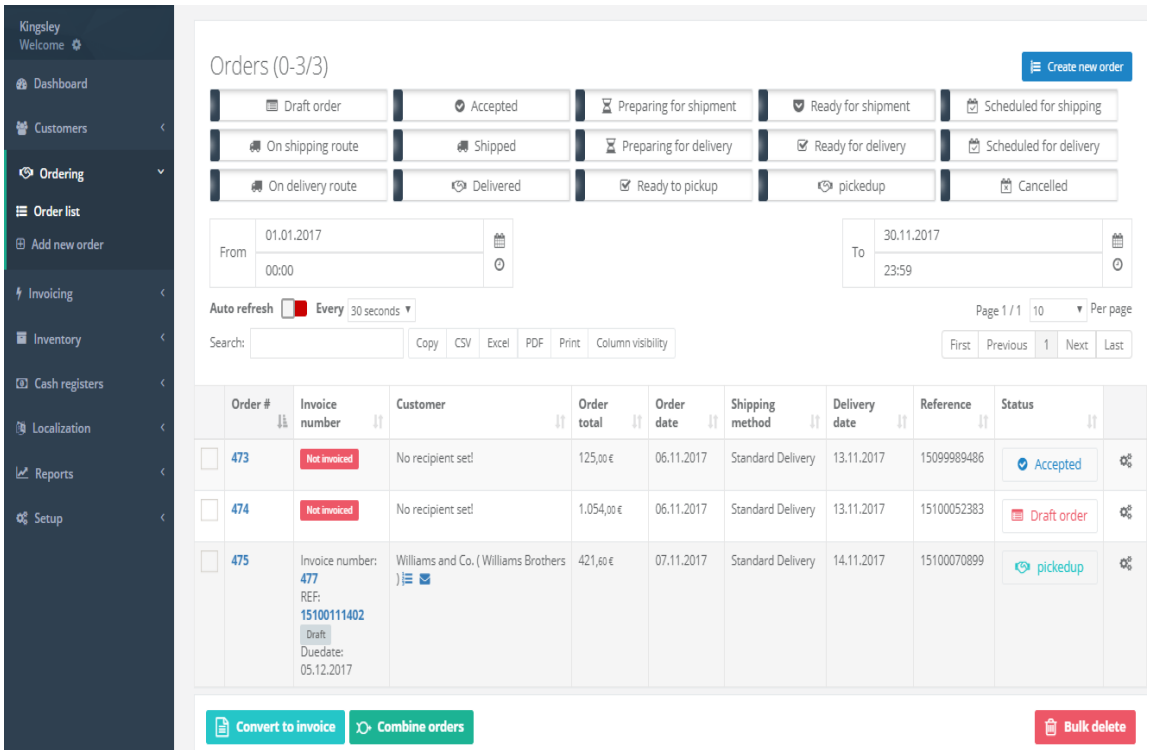


Figure 9. Order list.

On the other hand, as displayed in figure 9, the Order list pane shows all the orders and their current status in a well organised tabular list. Orders can automatically be converted to invoices by selecting the orders and clicking the “Convert to invoice” button. Orders can also be combined into a single order by simply selecting a set of orders and clicking the “Combine orders” button. However, above these is a collection of checkboxes representing all possible order statuses. They can be used for filtering the orders displayed on the table depending on the status.

4.4 Inventory Management Module

The Inventory Management Module is the most complex module within the ProInvoicer system. It is however, an important module as the functionality of the other modules revolve around it in one way or another. In this module, users can enlist their products and efficiently keep track of their inventory levels in their various warehouses or store locations. Also, product records can be organised based on shelves existing within the same or separate store locations. The system automatically updates inventory information in real-time as orders and sales are made. Furthermore, users are notified when

products begin to run out of stock. For perishable items, products can also be tracked depending on their expiry dates.

As can be seen in figure 10, the Inventory Management Module contains seven sub-menus. They are: Product list, Categories, Stock units, Brands, Suppliers, Warehouses/Stores and Shelves.

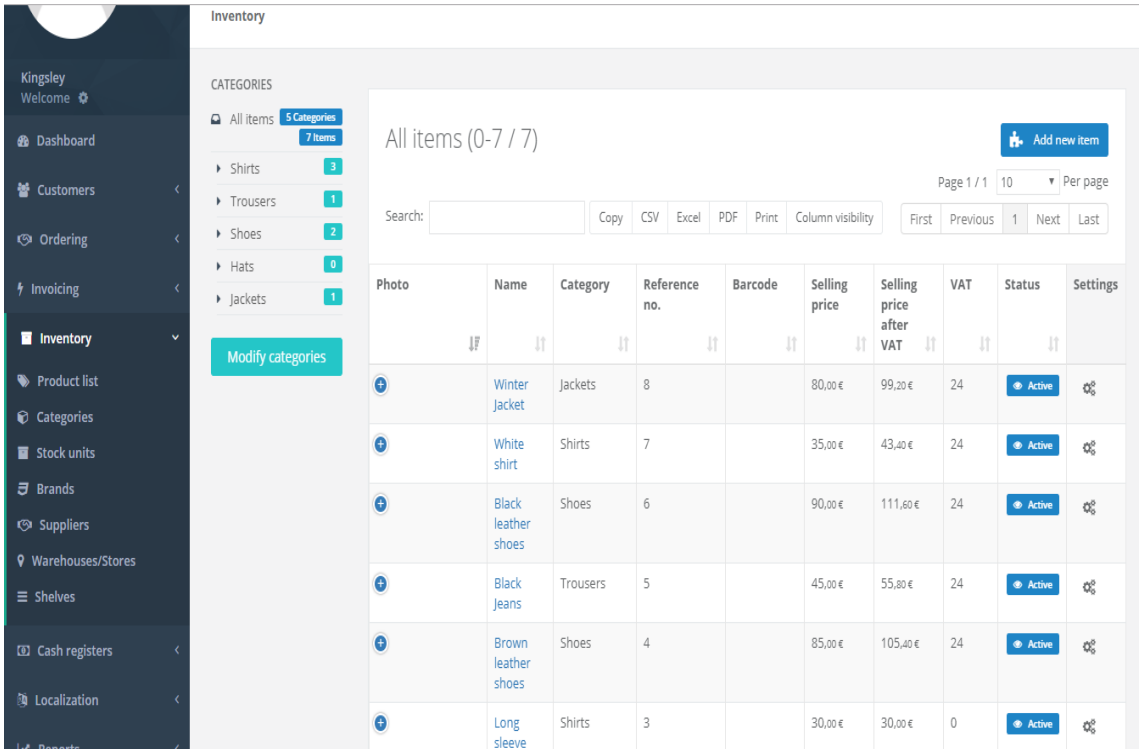


Figure 10. Product list.

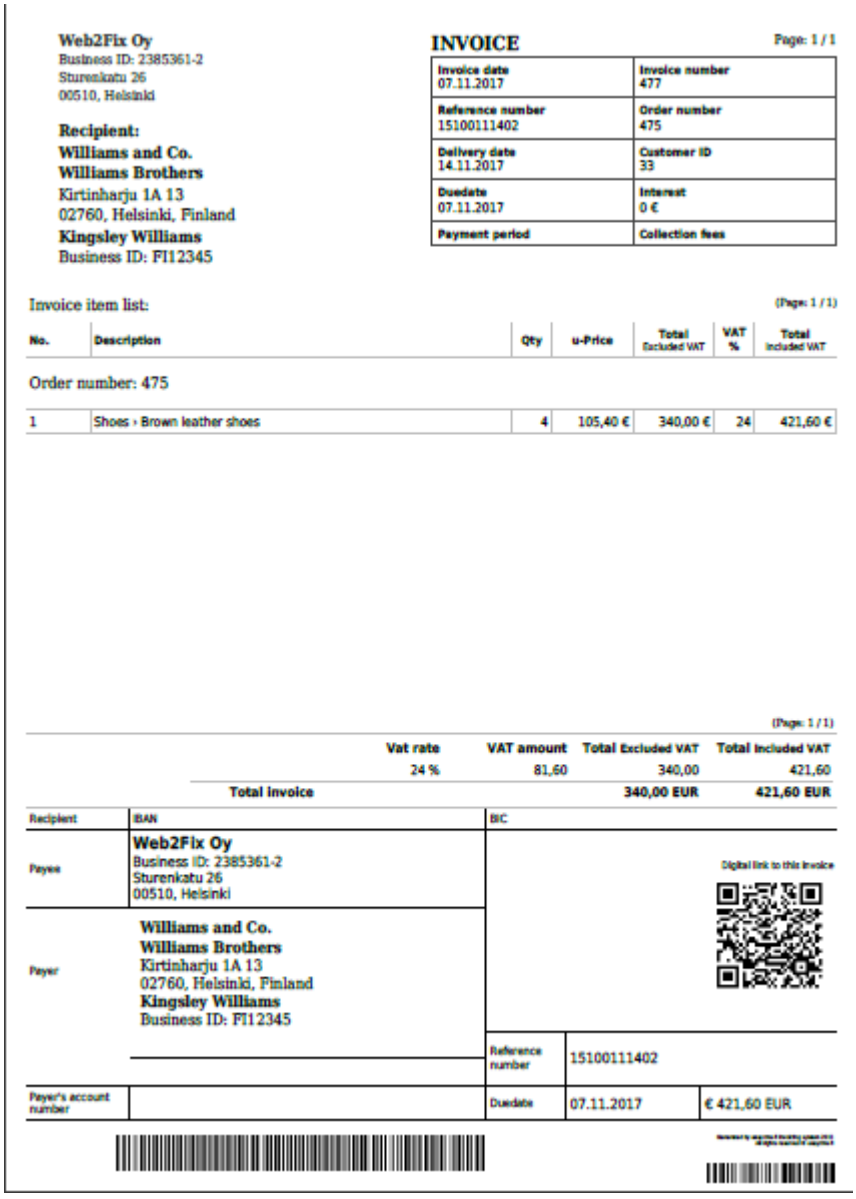
As figure 10 shows, in the Product list page, all items are organised in tables and can be sorted based on which table header parameter is selected. Among the headers are photo, name, category, reference number, barcode, selling price, selling price after VAT and status. To easily find a product item, the search bar above the table can be used for that purpose. On the left side of the table are product categories. Selecting any of them will display only the items in that category within the table. However, it is pertinent to note that products cannot be created without the existence of at least one category. Therefore, it is important to create a single or more categories before adding a product. It is optional to create brands, suppliers, stock units, warehouses and shelves. But these make product identification easier.

Stock unit is an indication of the unit parameter applied in selling a product. For example, drinks are sold in bottles, while books are sold in pieces; meaning that the stock unit for drinks is bottle while that of books is piece. Brands play a role in differentiating products, likewise suppliers. Products that share similar characteristics can easily be identified by their brands and suppliers.

The Warehouse/Store functionality helps store owners maintain updated stock information across shop or warehouse locations. Its accuracy and precision is even improved when combined with the Shelves functionality. The user or administrator sees the most recent product quantity anytime, from anywhere.

4.5 Invoice Management Module

The Invoice Management Module is where invoices are created and sent to customers. The Customer Relation, Inventory and Order modules all function together to create invoices. There are two methods for creating an invoice: first is by clicking “Create new invoice” button in the Invoice Management Module and filling the invoice form fields; second is by converting an existing order to invoice. Invoices can be sorted according to their status: Draft, Unpaid, Paid, Partially paid, Overdue, Collections, Cancelled and Refunded. Generated invoices can be sent to customers by email or SMS and the customers can make their payments through the invoice by connecting to their banks. This is made possible by integrating Checkout Finland’s online payment API (Application Programming Interface), a third-party payment service provider in Finland. Checkout offers online payment solutions including payment connections with several Finnish financial institutions, Visa, MasterCard, MobilePay and more. Invoices can also be viewed or downloaded in PDF format.



Web2Fix Oy
Business ID: 2385361-2
Sturenkatu 26
00510, Helsinki

Recipient:
Williams and Co.
Williams Brothers
Kirtinharju 1A 13
02760, Helsinki, Finland
Kingsley Williams
Business ID: FI12345

INVOICE

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Invoice date 07.11.2017	**Invoice number** 477
Reference number 15100111402	**Order number** 475
Delivery date 14.11.2017	**Customer ID** 33
Duedate 07.11.2017	**Interest** 0 €
Payment period	**Collection fees**

Invoice item list:

(Page: 1 / 1)

No.	Description	Qty	u-Price	Total Excluded VAT	VAT %	Total Included VAT
Order number: 475						
1	Shoes › Brown leather shoes	4	105,40 €	340,00 €	24	421,60 €

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	Vat rate	VAT amount	Total Excluded VAT	Total Included VAT
	24 %	81,60	340,00	421,60
Total invoice			**340,00 EUR**	**421,60 EUR**

Recipient	IBAN	BIC	
Payee	**Web2Fix Oy** Business ID: 2385361-2 Sturenkatu 26 00510, Helsinki		Digital link to this invoice
Payer	**Williams and Co.** **Williams Brothers** Kirtinharju 1A 13 02760, Helsinki, Finland **Kingsley Williams** Business ID: FI12345	Reference number	15100111402
Payer's account number		Duedate	07.11.2017 € 421,60 EUR

Figure 11. PDF invoice.

Figure 11 shows a standard PDF invoice. It has been ensured that all necessary data required by law for an invoice document is added to our invoices.

4.6 Reports Module

This module presents a summary of all transactions in concise and logical order. They are presented as report summary, invoice reports, order reports, customer invoice reports and income report. The report summary shows all orders, invoices and total income

in graphical illustration. Invoice reports and order reports show all invoice and order related transactions and their status. These can be filtered by date. Customer reports can be viewed based on invoices for each individual customer as well as all customers. The income report shows a summary of all income, the currencies applied, VAT percentage rate and VAT amounts. The reports module provides significant advantage for book keeping and accounting purposes.

4.7 System Functionality and Features

Although the ProInvoicer system has multiple features, only the most important from the point of view of this study will be discussed here.

- Multilingual Capability: Users can send invoices in their own language by email and SMS while their customers receive the invoices in customers' own language of choice, anywhere in the world.

- Document Storage: All invoices and orders are stored in the database along with payments and invoice status. They can be viewed or edited at any time and every user gets unlimited storage capacity.

- Export to PDF: The system has an in-built PDF converter that allows invoices to be viewed, downloaded or attached and sent via email in PDF format. Invoice or order lists can also be downloaded in PDF, Excel or CSV (Comma Separated Values) formats.

- Email and SMS Functionality: An invoice can be emailed as a PDF straight away to a customer immediately it is generated. The system is also integrated with SMS web service with which invoices can also be sent via SMS.

- Security: The system’s login and authentication system is military grade encrypted with double hashed 512bits encryption. This is done by combining the login details of the visitor on each login attempt. After five failed login attempts, the user's IP address is banned.

To restrict unwarranted access, three account types have been created for users: The Administrator, the User and the Accountant account types. The administrator account has unrestricted authorization to all permissions and has rights to create new users and accountants. But a user account's rights are limited compared to the administrator account, while an accountant's account is even more restricted.

- Location Management: ProInvoicer system enables users to add and manage an unlimited number of store or warehouse locations and shelves in those locations with ease. With this, they have access to the most up-to-date inventory levels and ability to make adjustments with the click of a button.

- VAT Selector: Users are given the flexibility to create and apply VAT rates to orders or invoices while generating them.

- Data Search: Specific invoices, orders or products can be searched from long lists with any parameter such as ID, name or number.

- Currency Flexibility: Using Google API, the system applies relevant exchange rates when currencies are being converted in invoices.

More features are being added to the system on a continuous basis. This is to ensure that all customer needs are fully met and even exceeded.

5 System Development

5.1 Development Tools and Technologies

To enhance compatibility, the application was mostly developed and tested under a real production environment. This is technically advisable since various development environments may differ from the production environment in requirements; for instance, the Apache version running on the server.

The application is hosted on a Linux based web server running Apache 2.4. The application's domain name is www.easycms.fi/admin. The server side scripting language adopted was PHP, with MySQL as the Relational Database Management System. JavaScript was used for the client side scripting with jQuery library and AJAX technology. Invariably, HTML and CSS were used for content presentation semantics and application design. Sublime Text was the IDE (Integrated Development Environment) used and it was connected to the remote server over the Internet using SSH (Secure Shell) encrypted tunnels.

- PHP

  PHP stands for Hypertext Pre-processor, but it formerly stood for Personal Home Pages. PHP is a server side scripting language used for creating dynamic web content; that is, websites that users can interact with; that are not served statically. It can be used to store and retrieve data from a database and then present it on a web page. To generate HTML, the PHP parser and a web server are required. When a user requests a page, the PHP script is interpreted at the web server by the PHP interpreter (also called parser), by executing the operations prompted in the script. Notably, this process does not consume CPU resources.

  Nowadays, PHP is also popularly used for generating XML documents, Flash animations, graphics, PDF files, [19] which has become very important in the project development. According to Greg Michillie from Google, three-quarters of the entire website population around the world was powered by PHP in May 2013. However, by July 2016, this statistic had increased to more than 82%.

The entire back-end scripting of the ProInvoicer system has been done with PHP. There are many good reasons for choosing PHP such as the ones listed below.

Performance: PHP codes execute with much faster speed than those of other scripting languages such as ASP.NET or JSP. One server is enough to withstand millions of hits in a single day.

Portability: PHP is compatible with all the major operating systems such as Microsoft Windows, Mac OS X and various Unix variants like Linux, FreeBSD, Debian, Solaris and Ubuntu which is the operating system installed on Web2Fix Oy's computers. A functional PHP script can always be run on another platform with ease.

Database Integration: PHP is known for having support for a vast array of databases. It has flexible connectivity to all major database systems such as MySQL, PostgreSQL, MS-SQL, Oracle, Sybase, DB2, and more. It is also compliant to the Open Database Connectivity (ODBC) standard, with which connection can be established with any database running the ODBC driver. Furthermore, there is a database abstraction layer in PHP known as PHP Database Objects (PDOs), which provides constant access and enhances secure programming practices.

Inbuilt Libraries: PHP comes with multiple inbuilt functions for various operations. With a few lines of code, PHP can easily perform a significant number of tasks on the fly; for instance: generating PDF documents, GIF, JPEG, and PNG images, parsing XML, connecting to web services, using cookies, sending emails and much more.

Ease of Learning: It is quite easy to learn PHP. Since its syntax was adapted from C and Perl. Having knowledge of these programming languages would enable beginners learn at a higher speed.

Cost: PHP is free for anyone to use and its latest version can be downloaded at http://www.php.net.

- MySQL

MySQL is believed to be the most popular Open Source database management system for web servers. It powers some of the most-high profile web applications. It operates at extremely high speed without putting heavy pressure on system resources and its usage comes at no financial cost. It is highly scalable, as it grows proportionately with the website it stores data for.

- JavaScript

  JavaScript is popularly known as the programming language for the web and it is most commonly used for client-side development. It is compatible with a majority of web browsers like Chrome, Firefox, Safari, Edge, Opera, and most browsers in mobile devices. JavaScript was built to enable scripting manipulation of all the elements of a HTML document. With it, users can dynamically interact with web pages, enabling a more user-friendly experience such as animations, interactive maps, validating form inputs and displaying prompts. To make our development process much faster and easier, we utilized JavaScript via the jQuery library.

- jQuery

  jQuery is a lightweight, fast and feature-rich JavaScript library which simplifies tasks like DOM manipulation, event handling and Ajax. It makes it easier to create extensive functionality with much less code than when regular JavaScript is employed. It is currently the most popular JavaScript library available and it is free to download and use. Importantly, by abstracting away browser differences, jQuery eliminates the need to write separate JavaScript code for different browsers due to incompatibilities.

- Ajax

  Ajax stands for Asynchronous JavaScript and XML. Ajax is a technology that provides a means by which data can be sent and retrieved from the server without refreshing a web page. This communication between the browser and server takes place in the background, and they are initiated by JavaScript code. Typically, when a response is received after a request is sent to a URL, the response is handled by a call-back function. Due to the asynchronous nature of the request,

other parts of the code carry on with their execution as the request is being processed. Although browsers have varying implementations for the Ajax API, jQuery solves this issue by providing cross-browser Ajax support. In most jQuery applications, data is being transported as plain HTML or JSON (JavaScript Object Notation) rather than with XML.

- HTML

  HTML (Hypertext Markup Language) is the web's most basic building block and it is used for giving structure to a web page and its content. Meaning that it tells the browser how to display a webpage. HTML is made up of a collection of elements which can be used for wrapping different parts of a web content.

- CSS

  CSS stands for Cascading Style Sheets. It is a stylesheet language used for describing the appearance or presentation of a document written in HTML or XML. It provides an easy mechanism for adding style to web documents. Being one of the fundamental languages of the open web, CSS has cross-browser standardization which is determined by W3C specification.

5.2 Implementation

- Testing

  At the end of every development cycle, the accomplished working prototype was sent to a third-party software testing and evaluating company located in Amsterdam, Netherlands. The bug results were then debugged.

- User Training

  In some cases, users of the application require training to smoothly navigate the system and utilize its features adequately. The extent of the training required is determined by several factors. The most prominent of these are: the scope of use

which is determined by the package that has been subscribed, personnel technical ability and motivation.

For this reason, personnel from the first set of customer companies were brought on site to undergo a few training sessions. On other occasions, staff from Web2Fix Oy had to visit the customer. The adverse effect of this practice is the loss of valuable time and cost. Also, the company has ambitions to grow in the future to locations all over Finland and beyond. This would make dependence on the present consultation strategy impractical. Consequently, free video tutorials are being prepared to serve this purpose to enable users easily learn from any location and at any time. Also, a plan is being made to produce a properly written documentation to provide usage guidance for customers.

- Configuration

The only procedure required to begin using the system is signing up to the service at http://www.prolasku.com. After that, a database is automatically created for the user who is immediately redirected to the administration panel where usage of the system can commence. Subsequently, users will have to correctly configure their SMTP settings to be able to send emails and notifications. This configuration can be done in the accounts area.

6 Conclusion

The main goal of this project was to develop an online invoicing system based on the Software as a Service model. This has almost been accomplished, although wider distribution of the product has not commenced. The front-end website that will handle customer subscriptions is currently under development at the time of writing and bugs are still being fixed on the back-end administration panel. This is done in close cooperation with a few early customers whose ongoing use of the system exposed some previously hidden bugs.

Personally, I have acquired a significant amount of professional experience and exposure to company environments and work ethics. I have also made progress in personal adaption to teamwork.

There are plans to build the system into a full ERP solution in the future that would serve even the most advanced enterprises and be able to scale with the growing needs of each company. This requires high level enhancements to the system and addition of improved hardware infrastructure. With growing appetite for convenience among the wider population, companies are compelled to be more flexible and innovative in their product implementation and service delivery.

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